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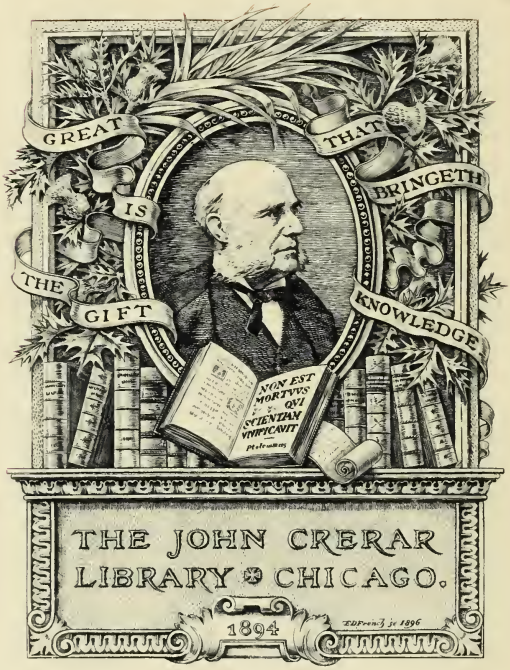
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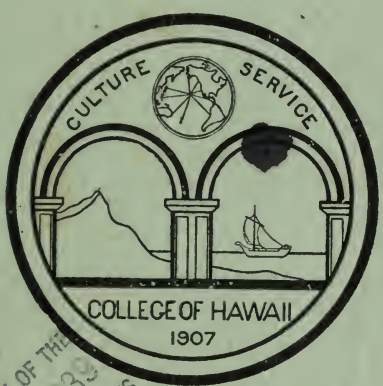
COLLEGE RECORDS SERIES 1, NO. 4

COLLEGE OF HAWAII

ANNUAL CATALOGUE

1909-1910



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HONOLULU:
PUBLISHED BY THE COLLEGE
FEB. 1910

JULY 1910

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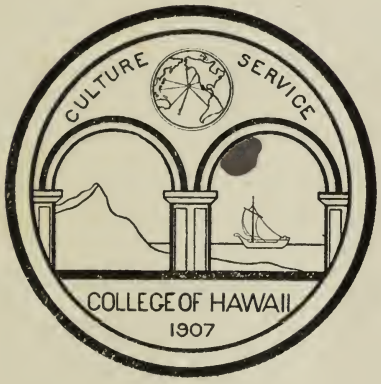
COLLEGE RECORDS SERIES 1, NO. 4

COLLEGE OF HAWAII

ANNUAL CATALOGUE

1909-1910



HONOLULU:
PUBLISHED BY THE COLLEGE
FEB. 1910

CALENDAR

1910.

September 7,	Entrance Examinations begin	Wednesday
September 12,	Academic year begins. Matriculation of new students	Monday
September 13,	Instruction begins	Tuesday
November 24,	Thanksgiving Day	Thursday
December 24,	Christmas recess begins	Saturday

1911.

January 2,	Work resumed	Monday
January 26,	First semester ends	Thursday

January 30,	Second semester begins	Monday
February 22,	Washington's Birthday	Wednesday
May 30,	Memorial Day	Tuesday
June 3,	Second semester ends	Saturday

BOARD OF REGENTS.

HON. HENRY ERNEST COOPER, L. L. B.....*President*

RALPH SHELDON HOSMER, B. A. S., M. F.. *Vice-Pres.*

ALONZO GARTLEY, U. S. N. A. .....*Secretary*

C. MONTAGUE COOKE, PH.D.

A. A. WILDER, LL.B., M. L.

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THE FACULTY.

(Arranged by order of appointment).

JOHN W. GILMORE, B. S., M. S. A.
President, Professor of Rural Economy and Agronomy.

JOHN S. DONAGHHO, B. A.,
Professor of Mathematics and Astronomy.

JOHN M. YOUNG, M. E., M. M. E.,
Professor of Engineering and Engineer for the College.

BRIGGS E. PORTER, B. S. A.,
Professor of Animal Husbandry.

WILLIAM A. BRYAN, B. S.
Professor of Zoology.

ARTHUR R. KELLER, C. E., LL. B.
Professor of Civil Engineering.

FRANK T. DILLINGHAM, B. S.,
Professor of Chemistry.

VALENTIN BUEHNER, B. S.,
Asst. Professor of German and French.

VAUGHAN MacCAUGHEY, B. S. A.,
Asst. Professor of Botany and Horticulture.

MINNIE E. CHIPMAN,
Asst. Professor of Ceramics.

AGNES HUNT, B. S.,
Asst. Professor of Domestic Science.

RAYMOND C. SEVERANCE, B. S.,
Instructor in Chemistry.

MILDRED M. YODER, A. B.,
Instructor in English.

CARRIE P. GREEN,
Librarian.

THE COLLEGE OF HAWAII.

The College of Hawaii owes its origin to an act of Congress entitled: "An Act Donating Public Lands to the several States and Territories which may provide Colleges for the benefit of Agriculture and the Mechanic Arts," approved July 2, 1862. The amount of land set aside was 30,000 acres for each Senator and Representative in Congress. This land was to be sold and the income devoted to "The endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts (in such manner as the Legislatures of the States may respectively prescribe), in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Three purposes are pointed out in this law, namely: to provide for a liberal education, to give intellectual training in the branches of learning that are related to agriculture and the mechanic arts, and to offer this instruction to the industrial classes. The College of Hawaii is organized to carry out these objects.

The College owes its existence and maintenance to the following resolutions and acts:

Concurrent Resolutions, Adopted May 25, 1906.

"Whereas, the industries of this Territory are almost exclusively agricultural and our future development must depend for its best progress upon the thorough education of our youth, and,

"Whereas, the Federal Government has provided a means for the establishment and maintenance of Colleges of Agriculture and Mechanical Arts,

"Therefore, be it Resolved by the Legislature of the Territory of Hawaii in Special Session assembled, that the Com-

missioners of Public Instruction are hereby authorized and directed to thoroughly investigate the requirements under the Federal Law, the probable expense to the Territory, a possible practical site for such a college, the suitableness of Lahainaluna for such a purpose, and other details that will enable prompt and intelligent action should it be desirable, and report to the next regular session of the Legislature."

The above resolution was framed by Mr. Wallace R. Farrington and introduced by Representative Coelho, of Maui.

After considerable investigation by a Committee of the Department of Public Instruction, consisting of the Commissioners and the Superintendent, a report was presented to the Legislature, which resulted in the appointment of a special committee, appointed by the Governor from members of the University Club, consisting of the Hon. H. E. Cooper, Mr. C. R. Hemenway, and Mr. R. S. Hosmer. Two acts were framed and introduced by Senator Coelho and passed by the Legislature at the regular session of 1907 without opposition. The acts follow.

ACT 24.

Session Laws of the Legislature of Hawaii, 1907.

An Act

To Establish the College of Agriculture and Mechanic Arts of the Territory of Hawaii, and to Provide for the Government and Support Thereof.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. The Governor shall nominate and by and with the advice and consent of the Senate, shall appoint five persons who shall constitute the Board of Regents of the College of Agriculture and Mechanic Arts of the Territory of Hawaii, which is hereby established.

Section 2. The persons appointed in accordance with Section 1 of this Act shall be residents of the Territory of Hawaii and not less than twenty-five years of age. One member of the

Board of Regents shall be appointed for the term of one year, two for two years, and two for three years, and their successors shall thereafter be appointed for the term of four years.

SECTION 3. [As amended by Act 127, Session Laws 1909.] The Board of Regents shall have the general management and control of the affairs of the college. They shall have power to appoint a treasurer and such other officers as they deem necessary and to require them to give bonds in such amounts as they may prescribe and in the form prescribed by law for bonds of public officers. They shall have power to purchase or otherwise acquire lands, buildings, appliances, and other property for the purposes of the college, and expend such sums of money as may be from time to time placed at the disposal of the college from whatever source. The grants of moneys and the purposes of said grants authorized by the Act of Congress, approved August 30, 1890, for the more complete endowment and maintenance of colleges for the benefit of agriculture and the mechanic arts and by any other Acts of Congress for similar purposes, are hereby assented to. All lands, buildings, appliances, and other property so purchased or acquired shall be and remain the property of the Territory of Hawaii to be used in perpetuity for the benefit of the college.

SECTION 4. The purposes of the college are to give thorough instruction in agriculture, mechanic arts and the natural sciences connected therewith, and such instruction in other branches of advanced learning as the Board of Regents may from time to time prescribe and to give such military instruction as the Federal Government may require. The standard of instruction in each course shall be equal to that given and required by similar colleges on the mainland and upon the successful completion of the prescribed course the Board of Regents are authorized to confer a corresponding degree upon all students who shall become entitled thereto.

SECTION 5. No person shall, because of age, sex, color, or nationality, be deprived of the privileges of this institution.

SECTION 6. The Faculty of the College shall be under the direction of a President, who shall be appointed by the Board of Regents. The members of the Faculty shall be likewise appointed.

Section 7. The official name of the Board of Regents shall be Board of Regents, College of Hawaii, and the Board shall adopt and use a common seal by which all official acts shall be authenticated.

Section 8. The Board of Regents shall have the authority to sue in its official name and shall be subject to be sued only in the manner provided for suits against the Territory of Hawaii.

Section 9. The Treasurer of the Territory is hereby authorized to pay from time to time to the Board of Regents upon their receipted vouchers such sums as may be available. The Board of Regents shall cause to be kept suitable books of account and shall submit to each session of the Legislature a statement showing the total receipts and expenditures.

Section 10. This Act shall take effect from and after the date of approval.

Approved this 25th. day of March, A. D. 1907.

G. R. Carter, Governor.

SUPPORT AND ORGANIZATION.

The Second Act (Act 94, Session Laws 1907) provided for appropriations from the Treasury of the Territory as follows:

Ten thousand dollars from the Loan Fund for buildings and fixtures.

Ten thousand dollars from Current Receipts for Salaries.

Five Thousand dollars from Current Receipts for Incidental Expenses.

The appropriation bill passed by the Legislature of 1909 provides an item of fifteen thousand dollars from Current Receipts for Salaries and Expenses for the Biennial Period, 1909-1911.

Hawaii being a territory does not benefit financially by the Land Grant Act of 1862, but it does benefit by the Morrill Act of 1890 appropriating fifteen thousand ($15,000) dollars with an augmentation each year of one thousand ($1000)

dollars until the sum shall have aggregated twenty-five thousand ($25,000) dollars. It also benefits from the Nelson Amendment to the Morrill Act of 1907, augmenting the original appropriation by five thousand ($5000) dollars annually until the total shall be fifty thousand ($50,000) dollars. By virtue of these acts the College of Hawaii receives this year, (1909-10) $40,000.

The College is now housed in two temporary buildings located in the residential district of the city of Honolulu, between Young and Beretania Sts., near Victoria St. These buildings provide for the library, the necessary class rooms for the work of the College, and also for the laboratories for chemical, physical, and biological sciences. As soon as the Legislature provides the necessary funds, permanent buildings will be erected.

More than thirty acres of land have been secured in Manoa Valley upon which the permanent buildings will be located. A plan for the development of the College has been prepared showing the relative positions of the various buildings for the branches of instruction that fall normally within the scope of activities of such an institution. The available land and the consummation of this plan will afford adequate facilities for all lines of work. A stream borders the property on one side, which when properly developed will furnish excellent facilities for power and experimental studies in irrigation and hydraulics.

COLLEGE LIBRARY.

The Library now contains about 5000 volumes of the more recent works on Agriculture, Engineering, the Mechanic Arts, the various Mathematical, Physical, Chemical, and Natural Sciences, as well as an excellent collection of books in English and in German Literature. In addition there are on the shelves about 7000 pamphlets, mostly bulletins of Agricultural Experiment Stations and of the United States Department of Agriculture. The Library has been made a depository for all government publications, which may be consulted freely by the public.

The Library is open during the day and early evening on all week days except Saturday, and persons, complying with the regulations, may withdraw books for home use.

Special Lectures.

In addition to the regular instruction of the College, courses of lectures and demonstrations both in the afternoon and the evening are given yearly. The subjects covered in these lectures pertain mainly to agriculture, household economics, literature, and to the various branches of pure and applied science. In addition to the members of the College Faculty the following specialists have presented subjects.

R. S. Hosmer, B. A. S., M. F.,
- Economics of Forestry.
- Forestry in Hawaii.

E. V. Wilcox, Ph. D.,
- Agricultural Problems in Hawaii.
- Ranching and Range Management.

Jacob Kotinsky, B. Sc.
- Methods and Results of Inspection.
- Our Insect Friends.
- Our Insect Enemies.

J. E. Higgins, M. S. A.,
- Production and Marketing of Fruits.
- The Fruits of Hawaii.

F. G. Krauss,
- Cotton Culture.
- Rice Culture.

COURSES AND DEGREES.

The College of Hawaii, without excluding ideals of scholarship and culture fosters education for service, and emphasizes for its students and for those interested in its welfare the fact that all vocations or activities by which men and women obtain a

living or from which they derive aesthetic stimulus have elements of educational value; that all work productive of good is dignified and that men and women should be educated toward wholesome service rather than away from it.

To this end, the College offers instruction in four courses, namely: a course in Science, a course in Agriculture, a course in Engineering, and a course in Household Economics. These courses require four years for completion and lead to the following degrees respectively: Bachelor of Science, Bachelor of Science in Agriculture, Bachelor of Science in Engineering, and Bachelor of Science in Household Economics. The advanced degrees, M. S., M. S. A., M. E., C. E., E. E., will be granted to Bachelors, who shall have completed the corresponding undergraduate course herein outlined or its equivalent, on the satisfactory completion of one year of resident graduate work, the presentation of an acceptable thesis and the passing of the required examinations. The equipment of the College and its environs afford excellent opportunity for research and the study of special problems.

In addition to the regular courses provision is made for special students in any group of subjects chosen by the student with the approval of the President and the Professor concerned.

Tuition in the College is free to residents of the Territory. Non-residents will be given information in regard to tuition on application to the President.

The year's work is divided into two semesters of eighteen weeks each. Recognition of work done is given in terms of credits; a credit generally being the equivalent of two and one-half hours spent in the preparation and the recitation of a lesson, or in the field or laboratory. The exact division of this time however is generally left to the discretion of the Professor in charge. A subject offering three credits usually means three recitations or class meetings per week throughout the semester.

The College is normally the crowning point of the school system of the Territory, and it is intended that its entrance requirements should coordinate with the requirements for graduation of the higher schools and academies located

throughout the Territory to the end of facilitating entrance from these to the College.

College Extension.

The College is planning, as opportunity presents itself, to conduct in outlying districts and on the other islands, lectures and demonstrations on subjects of general interests to the community.

The College is considering also Instruction by Correspondence in various subjects pertaining to Agriculture, Household Economics, and applied science.

REQUIREMENTS FOR ADMISSION.

Candidates may be admitted to the College in one of four ways as follows:

a By examination in specified subjects.

b By certificate from an accredited school, or from the College Entrance Examination Board.

c By transfer from other Colleges or Universities.

d By meeting the requirements prescribed for special students.

Admission by Examination.

Examinations for admission will be held at the College on Thursday, Friday, and Saturday, Sept. 8th, 9th, and 10th, 1909.

Schedule of Examinations.

First Day:

A. M.	8:30— 9:00	Registration at President's office.
	9:00—10:30	English.
	10:30—11:30	General History.
	11:30—12:30	Civil Government.
P. M.	1:30— 3:00	German or French.
	3:00— 4:00	United States History.
	4:00— 5:00	English History.

Second Day:

A. M.	9:00—10:30	Algebra.
	10:30—11:30	Physics.
	11:30—12:30	Botany.
P. M.	1:30— 3:00	Geometry.
	3:00— 4:00	Chemistry.
	4:00— 5:00	Zoology.

Third Day:

A. M.	9:00—10:30	Trigonometry.
	10:30—11:30	Geology.
	11:30—12:30	Astronomy.

Latin or Greek by special appointment.

Commercial Law, Book-keeping, and Stenography will not be accepted on examination. (See p. 22).

Candidates for admission to the College by examination must register at the office of the President at 8:30 A. M. on the first day of examination.

Candidates for admission to the College by examination must attain a grade of 60 per cent. in each subject.

Credits obtained by examination will hold good for one year.

Admission by Certificate.

Candidates for admission by certificate other than that furnished by the College Entrance Examination Board must present certificates endorsed by the principal of the school in which the preparatory work has been done. Blank certificates will be furnished on application and should be returned to the College properly filled out as soon thereafter as possible. Certificates must state definitely the amount of work done and the text-books used. After examination of the certificates submitted, candidates will be notified that credits are approved or that they must submit to entrance examinations in those subjects for which credits are held to be unsatisfactory.

Admission as Special Student.

Persons not less than eighteen years of age will be admitted to the College as "special students" either at the beginning

of the College year or at the beginning of the second semester, provided they furnish satisfactory evidence of previous training and a detailed statement of courses desired. Previous training shall be deemed satisfactory that manifestly enables the student to carry the work chosen.

Applicants for special courses should present to the President of the College or to a properly authorized College officer, all pertinent documents, not later than the day preceding the opening of the semester in which the applicants desire to enroll.

Permission to enroll as a special student shall bear the signed approval of the President of the College and of the officers in charge of the courses desired by the applicant before the student is permitted permanently to attend courses. Special students shall be subjected to the same standards of work in courses and to the same requirements regarding attendance at recitations, lectures, laboratory exercises, tests, and term examinations as are the regular students of the College.

ADMISSION TO THE FRESHMAN CLASS.

Fifteen credits, each credit signifying the pursuit of a subject five exercises a week for one academic year are required as follows:

Group I. Ten credits are required as follows:

English	3
German or French	2
General History	1
Algebra	1½
Plane and Solid Geometry	1½
Physics	1
	10

Group II. Five Credits are to be selected from the following:

English	1
Latin or Greek	2
United States History	1 or ½
English History	1 or ½
Civil Government	1 or ½
Plane Trigonometry*	½
Astronomy	½
Chemistry	1
Botany	1 or ½
Geology	½
Physiology	½
Zoology	1 or ½
Commercial Law	½
Book-keeping	½
Stenography	½

*Required of candidates desiring to specialize in Engineering.

ADMISSION TO ADVANCED STANDING.

Candidates for advanced standing must present credits satisfactory to the College, but no student will be accredited beyond the Junior year.

ENTRANCE SUBJECTS IN DETAIL.

English (Group 1).

The three credits in English should signify the completion of the following work:

a Complete Grammar.....1 credit
b Rhetoric and Composition.....1 credit
c Collateral reading, class room study.
and practice .....1 credit, or 2 credits*.

*Candidates presenting 4 credits in English will be required to offer 2 credits in this work.

As to the kind and the amount of work to be done in the preparatory courses, the suggestions and the outlines of work laid down by the College Entrance Examinations Board are considered satisfactory. In general however, it may be said that preparation in English assumes constant and systematic work throughout three academic years. For the work in grammar and rhetoric any recent book adapted to High School work such as Kellog's "Lessons in English," Lockwood's "Lessons in English," Genung's "Outlines of Rhetoric" will be satisfactory. The preparatory course in collateral reading, class room study, and practice should include such books as the following or their equivalent: For students entering in 1909, 1910, 1911: Shakespere's "The Merchant of Venice" and "Julius Caesar;" Bunyan's "The Pilgrim's Progress" (part 1); Addison's "Sir Roger de Coverly Papers" in the "Spectator;" Scott's "Lady of the Lake" and "Ivanhoe;" Irving's "Sketch Book" Macaulay's "Lays of Ancient Rome," Tennyson's "Gareth and Lynette," "Lancelot and Elaine," and the "Passing of Arthur;" George Eliott's "Silas Marner."

From the above list candidates entering by examination should be able to answer general questions. The examination, however, will not be designed to require evidence of minute drill in difficulties of verbal expression, unimportant allusions, technical details, etc., but rather to test the candidate's power of expression.

German (Group I).

Candidates offering German should have completed at least a systematic course of five exercises a week extending throughout two academic years. The preparation should include a thorough elementary knowledge of the gender of nouns and the declension of nouns and adjective; the personal, interrogative, relative, and demonstrative pronouns; the strong and the weak conjugations; the principal parts of the simpler strong verbs; the use of the modal auxiliaries, the use of the passive voice; the use of adverbs, prepositions, conjunctions; the various German sentence orders. Candidates should possess the ability of reading German with a clear and good pronunciation, of writing German readily from dictation, of trans-

lating with comparative ease elementary German into English and *vice versa*. Candidates should also have read a reasonable amount of acceptable German stories, such as: Storm's "Immensee," W. von Hillern's "Höher als die Kirche;" well known German lyrics; Gerstacker's "Germelshausen;" Heyse's "L' Arrabiata;" Zschokke's "Der zerbrochene Krug;" or their equivalents, either in narrative or dramatic literature, and should have read at least one standard work of German literature such as Goethe's "Hermann und Dorothea," Lessing's "Minna von Barnhelm" or Schiller's "Wilhelm Tell."

French (Group 1).

Candidates offering French should have completed at least a systematic course of five exercises a week extending throughout two academic years. The preparation should include a thorough elementary knowledge of the rudiments of grammar, including the plural of nouns, the inflection of adjectives, participles, and pronouns; the use of personal pronouns and the pronominal adjectives; the irregular verb forms; the simpler uses of the conditional and the subjunctive; common adverbs, prepositions, and conjunctions; the order of words in the sentence, and the elementary rules of syntax. Candidates should possess the ability of reading French with a clear and good pronunciation, of writing French readily from dictation, of translating with comparative ease elementary French into English and *vice versa*. Candidates should also have read a reasonable amount of acceptable French stories such as Mérimée's "Columbia;" Loti's "Pêcheur d' Islande;" Jules Sandeau's "Madamoiselle de la Seigliére" or their equivalents, either in narrative or dramatic literature, and should also have read at least one standard work of French literature such as Moliére's "L' Avare," Corneille's "Le Cid," Racine's "Athalie," or a work by such writers as About, Béranger, Daudet, La Bréte, Madame de Sévigné, Hugo Labiche, George Sand, Sandeau, Scribe, Theirs, Vigny, Voltaire.

Latin (Group II).

Candidates offering Latin should have completed at least a systematic elementary course of five exercises a week extending

throughout two academic years. The preparation should include the study of Latin forms and inflection, the practice of reading at sight and of writing from dictation, the knowledge of elementary syntax and etymology. The candidate should have read and reviewed at least Caesar's Gallic War, books I-IV, or an equivalent, and not less than two of Cicero's Orations. Work should also have been done in composition.

Greek (Group II).

Candidates offering Greek for entrance should have completed at least a systematic elementary course of five exercises a week extending throughout two academic years. The preparation should include the study of Greek forms and inflection, the practice of reading at sight and of writing from dictation, the knowledge of etymology and syntax. The candidate should have read and reviewed at least Xenophon's Anabasis, Books I-III, or an equivalent. Work should also have been done in composition.

General History (Group I).

The one credit in General History should cover an amount equal to Anderson's or Meyer's "General History,"

United States History (Group II).

Candidates offering one credit in United States History should have completed a course equivalent to five exercises a week throughout one academic year. Preparation should cover the main facts in American History as presented in such texts as:

McLaughlin's "History of the American Nation."

Channing's "Student History of the United States."

Hart's "Essentials in American History."

For one-half credit in this subject, one-half the time indicated above will be accepted.

English History (Group II).

Candidates offering one credit in English History should have completed a course equivalent to five exercises a week extending throughout one academic year. The preparation should cover the subject as presented in such texts as:

Larned's "History of England."

Cheney's "Short History of England."

Green's "Short History of the English People."

For one-half credit in this subject one-half the time indicated above will be accepted.

Civil Government (Group II).

Candidates offering one credit in Civil Government should have completed a course equivalent to five exercises a week extending throughout one academic year. The work should cover the essentials of a republican form of government as is presented in such text books as:

Fiske's "Civil Government."

Boynton's "School Civics."

Macey's "Civil Government."

For one-half credit in this subject, one-half the time indicated above will be accepted.

Algebra (Group 1).

The one and one-half credits in Algebra require thorough acquaintance with the following topics: the fundamental operations; involution and evolution; factoring, highest common factor, lowest common multiple; fractions; simple and quadratic equations involving one unknown quantity; simultaneous equations, simple and quadratic; equations involving radicals, and equations reducible to quadratic form; theory of indices. The preparation should be equivalent to five exercises a week for at least one and one-half years in such texts as:

Beman and Smith's "Academic Algebra."

Taylor's "Elements of Algebra."

Tanner's "Elementary Algebra."

Geometry (Group I).

The credits in geometry require familiarity with the subject as treated in Beman and Smith's "Plane and Solid Geometry," or an equivalent text; a clear understanding of the meaning and use of locus propositions; ability to originate proofs and constructions, and to apply theorems of proportion and of mensuration in numerical computations.

In plane geometry the preparation should be the equivalent of five exercises a week for at least one year; in solid geometry of five periods a week for one-half year.

Trigonometry (Group II).

Candidates offering plane trigonometry should have completed a course equivalent to five exercises a week throughout one-half an academic year. The preparation should cover proofs of formulae, transformation of formulae, solution of equations, and of triangles with or without logarithms, as presented in such texts as:

Wentworth's "Revised Trigonometry."

Phillips and Fisher's "Elements of Trigonometry."

Bowser's "Elements of Trigonometry."

Astronomy (Group II).

Candidates offering astronomy should have completed a course equivalent to five exercises a week throughout one-half an academic year in such a text as Young's "Lessons in Astronomy," and should be able to recognize the more important fixed stars and to describe the characteristics and motions of the members of the solar system. Practice with the telescope is not essential but the course should be accompanied by naked eye observations of planetary movements.

Physics (Group I).

The credit in Physics requires the completion of the subject as given in the High School text-books of Hall and Ber-

gen, Milliken and Gale, Wentworth and Hill, or other late texts of the same grade. The study should extend throughout one academic year. It is recommended that it be accompanied by laboratory work covering at least forty experiments of a quantitative character. A note book giving satisfactory evidence of laboratory work done must be submitted. In addition a thorough working knowledge of the Metric System of Weights and Measures is required.

Chemistry (Group II).

Candidates offering chemistry should have studied the subject for one academic year, and should be familiar with the following topics: Properties of the principal non-metallic elements and their compounds; simple problems involving relations by weights and relations between volumes of gases and weights of chemically related liquids and solids; acids, bases, and salts; atoms, molecules, atomic weights, and valence; series of oxy-acids and their salts; oxidation and reduction; poly-acids; acid anhydrides and metallic oxides. The textbook should be of the same grade as Henderson and McPherson's "Elementary Chemistry" or Peters' "Modern Chemistry."

Botany (Group II).

Candidates offering one credit in Botany should have completed a course equivalent to five exercises a week throughout one academic year. The preparation should cover the structure, elementary physiology, and classification of the seed-bearing plants; and should include if possible, laboratory practice involving the use of the compound microscope. Such texts as: Bailey's "Elementary Botany" and Atkinson's "Elementary Botany" are recommended. Candidates who offer one-half credit should have followed the subject for one-half the time indicated above.

Geology (Group II).

Candidates offering Geology should have completed a course equivalent to five exercises a week throughout one-half an academic year, in such texts as:

Tarr's "Elementary Geology."
Le Conte's "Elements of Geology."
Brigham's "Geology."

Physical Geography (Group II).

Candidates offering Physical Geography should have completed a course equivalent to five exercises a week throughout one-half an academic year in such texts as:

Dryden's "Lessons in Physical Geography."
Brigham and Gilbert's "Physical Geography."
Tarr's "Physical Geography."

Physiology (Group II).

Candidates offerings physiology should have completed a course equivalent to five exercises a week throughout one-half an academic year. The preparation should cover the hygiene, the morphology, and the functions of the organs of the human body as presented in Martin-Fitz's "Human Body" or an equivalent text.

Zoology (Group II).

Candidates offering one credit in Zoology should have completed a course equivalent to five hours a week throughout one academic year covering the salient characters of the branches, classes, and orders of animals, with special emphasis on laboratory study of type specimens in each class. The texts recommended are:

Needham's "Elementary Lessons in Zoology."
Kellogg's "Elementary Zoology."
Catton's "Practical Zoology."

For one-half credit, one-half the time indicated above will be accepted.

Commercial Law, Book-keeping, and Stenography (Group II).

Candidates offering one-half credit in any of these subjects must furnish documentary evidence satisfactory as to the amount and character of the work done.

DEPARTMENT OF ARTS AND SCIENCE.

The science course is designed to meet the needs of those students desiring a general training in scientific subjects. For the first two years the arrangements of subjects is practically the same as in the Agricultural and Household Economics courses. Mathematics, the languages: English, and German or French, and the sciences: Physics, Chemistry, Botany, Zoology, and Geology are taken up. During the Junior and Senior years in order to give the student sufficient training in some one science to enable him to follow it as a profession, and in order to meet a local need not met by the other courses, Chemistry is given a prominent place. Enough chemistry is required thoroughly to acquaint the student with the essential branches of the subject. By a liberal number of elective credits, students who wish further to specialize in chemistry; students who wish to supplement their chemical training with other sciences, mathematics, and engineering subjects; and students who wish a more general training in languages and arts are all accommodated.

Equipment. The equipment for instruction in the sciences is extensive and modern. It includes for use in the biological sciences, several Bausch and Lomb compound microscopes, two of the best microtomes arranged to cut sections one micron in thickness, a complete manakin, a skeleton, a set of physiological charts, and a number of dissecting microscopes fitted with camera lucida attachments.

For Physics in addition to the ordinary apparatus for lecture demonstrations and laboratory work, there is a complete X-ray apparatus and a lecture-room wireless telegraph outfit. A six-inch telescope and three-inch transit have been provided; also an adequate set of meterological apparatus to supplement class-room instruction on this subject.

For Chemistry, the laboratories though small are well equipped, and the student is furnished with all the supplies needed for his work. For more advanced work there are complete sets of apparatus for gas analysis and oil testing, a Lippich's Half-shadow Polariscope for 400 mm. tubes with latest form Landolt's adjustable control tube, and a Rueprecht chemical bal-

ance, besides student balances, platinum ware, blast and suction apparatus and other conveniences for advanced analytical work.

For use in all departments there is a photographic dark room fully equipped, an enlarging and reducing outfit, a panoramic and a telescopic camera, besides small cameras for field work, and a fine stereopticon.

The library contains a large number of the best and latest books on the different sciences. New books are constantly being added, and complete sets of bound volumes of periodicals will be purchased as fast as they are needed and can be found in the market.

Science Course.

1st Year.

	No. of course.	Credits 1st sem.	Credits 2d sem.
Mathematics	1 & 2	3	3
English	1 & 2	3	3
German or French	1 & 2	3	3
Chemistry	1 & 2	3	3
Botany	1 & 2	3	3
Drawing	1	2	2

2d Year.

English	3 & 4	3	3
German or French	3 & 4	3	3
Chemistry	3	2	..
Chemistry	4	3	..
Chemistry	5	..	3
Chemistry	6	..	3
Physics	1 & 2	3	2
Zoology	1	3	..
Geology	1	..	3

3rd Year.

Botany	4	3	..
Chemistry	7	3	..
Chemistry	10	4	..
Entomology	1	..	3
Chemistry	12	..	4
Chemistry	13	..	3
Electives		5	5

4th Year.

Economics	1 & 2	3	3
History	3 & 4	3	3
Chemistry	15	1	..
Chemistry	16	3	..
Chemistry	17	..	1
Chemistry	18	..	5
Electives		5	3

Synopsis of Courses.

MATHEMATICS.

1. *Geometry and Trigonometry.* A rapid review of plane and solid geometry, with emphasis upon the latter, and a course in plane and spherical trigonometry with practical problems. Required of all freshmen except the engineering students. 1st semester, 3 credits.

2. *Algebra.* Simple series, inequalities, symmetric functions, binomial theorem, permutations and combinations, probability, elements of the theory of equations, determinants, expansion of functions in series, convergence of series. Required of all freshmen except engineering students. 2d semester, 3 credits.

3. *Mathematics for Engineers.* A rapid review of geometry and trigonometry, followed by work in algebra similar to that of course 2. Students registering for this course must present solid geometry and triogonometry for entrance, to-

gether with all of the algebra embraced in such a text as Beman and Smith's Academic Algebra. Required of engineering students. 1st semester, 5 credits.

4. *Analytic Geometry.* The essentials of analytic geometry, with a beginning in differentiation. An introduction to the calculus, with many practical problems. Required of engineering students. 2d semester, 5 credits.

5. *Calculus.* Differential and integral calculus, with practical problems. Required of engineering students. 1st semester, 3 credits.

6. *Calculus.* Continuation of course 5. Required of engineering students. 2d semester, 3 credits.

7. *Astronomy.* A general course in descriptive astronomy, introducing mathematical discussions so far as the preparation of the class will permit. 1st semester, 3 credits.

ENGLISH.

1. *Rhetoric and Composition.* Required of all freshmen. 1st semester, 3 credits.

2. *Rhetoric and Composition.* Discussion of the elemtnts of prose style, study of illustrative extracts. Prerequisite: course 1. 2d semester, 3 credits.

3. *American Literature.* Study of text books, lectures, collateral training. Prerequisite: course 2. 1st semester, 3 credits.

4. *English Literature.* Study of text book, lectures, collateral reading. Prerequisite: course 3. 2d semester, 3 credits.

Students, other than those who may have already successfully taken courses 1-4 will be admitted to courses 5 and 6 only upon presentation of satisfactory evidence of fitness.

5. *English Literature.* Study of special periods or authors connected with English or American literature; writing of themes; collateral reading; elective. 1st semester, 3 credits.

6. *English Literature.* Continuation of course 5. Class room discussion and debates as occasion allows. Prerequisite: course 5. 2d semester, 3 credits.

HISTORY AND ECONOMICS.

1. *English Economic and Industrial History.* A course of lectures, recitations and reading dealing with the disappearance of serfdom, the rise of industrial efficiency, the protectionist, free trade, and modern labor movements and other phases of English history in their bearing on the welfare of the people. 1st semester, 3 credits.

2. *American Economic and Industrial History.* A course of lectures, recitations, and library work dealing with the economic aspects of American colonization, colonial commerce, manufacture, and labor supply, the development of internal improvement, agriculture, transportation, and industrial expansion. 2d semester, 3 credits.

3. *Principles of Political Economy.* A course of lectures, recitations, and library work on the meaning and application of the conceptions of wealth, value, money, utility, capital, supply, demand, distribution, wages, profits, rents, interest, and credit. 1st semester, 3 credits.

4. *Political Institutions.* A course of lectures, recitations, and library work on the principles of politics and the development of political institutions. Constitutional and administrative laws with reference to their practical working. 2d semester, 3 credits.

1. *Psychology.* The topics of sensation, affection, and attention are discussed in detail, and some time is devoted to the psychology of the abnormal (dreaming, hypnosis, and insanity) and to comparative psychology. This course includes lectures on the more complex mental processes, emotion action, and association. Students who intend to enter upon this course are advised to take Physiology. Illustrated lectures, recitations, and laboratory practice. 1st semester, 3 credits.

GERMAN.

1. *Elementary German.* Grammar, pronunciation, sentence writing, reading of connected prose. Required of all freshmen who have not received entrance credits in German or who are not taking advanced French. 1st semester, 3 credits.

2. *Intermediate German.* Comprehensive review of the essentials of grammar, study of special grammatical topics, investigation of the elements of German syntax, translation of prose and poetical selections, prose composition, acquirement of a practical vocabulary, conversation. Prerequisite: course 1. 2d semester, 3 credits.

3. *Advanced German.* Reading of advanced prose, study of a representative work by Lessing, Schiller, or Goethe. Sight reading, composition, conversation. Required of all sophomores who have taken courses 1 and 2. Open to all freshmen who have received entrance credits in German. 1st semester, 3 credits.

4. *Advanced German.* Reading of scientific German, reading of collateral assignments outside of class; study of at least one representative work of modern German literature. Sight reading, prose composition, conversation. Prerequisite: course 3. 2d semester, 3 credits.

5. *Advanced Elective German.* Advanced conversation, composition, and reading, literary study of at least one standard work of German classical literature in class; outside reading of modern German prose with written reports thereon. Open to all juniors who have attained a good rank in courses 1-4. Special students, other than those who may have already successfully taken courses 1-4, will be admitted to courses 5 and 6, only upon presentation of satisfactory evidence of fitness. 1st semester, 3 credits.

6. *Advanced Elective German.* Lectures on the history and development of German literature; frequent talks and discussion on phases of German life, institutions, and ideals, practice in reading aloud of German prose and verse; collateral reading outside of class of modern German novelists or dramatists with written reports thereon. Prerequisite: course 5. 2d semester, 3 credits.

FRENCH.

1. *Elementary French.* Grammar, pronunciation, sentence writing, reading of connected prose. Required of all freshmen who have not received entrance credits in French or who are not taking advanced German. 1st semester, 3 credits.

2. *Intermediate French.* Review of grammar, reading of prose and poetical selection; prose composition. Prerequisite: course 1. 2d semester, 3 credits.

3. *Advanced French.* Reading of advanced prose, study of a representative work of French tragedy or fiction; sight reading, composition, conversation. Required of all sophomores who have taken courses 1 and 2. Open to all freshmen who have received entrance credits in French. 1st semester, 3 credits.

4. *Advanced French.* Rapid reading in and out of the class of representative French authors, prose composition, conversation. Prerequisite: course 3. 2d semester, 3 credits.

5. *Advanced Elective French.* Advanced conversation, and reading; literary study of at least one work of French classical literature; outside reading of modern French prose with written reports thereon. Open to all juniors who have attained a good rank in courses 1-4. Special students, other than those who may have already successfully taken courses 1-4 will be admitted to courses 5 and 6 only upon presentation of satisfactory evidence of fitness. 1st semester, 3 credits.

6. *Advanced French.* Lectures on the history and development of French literature; frequent talks and discussion on phases of French life; practice in reading aloud of French prose and verse; collateral reading outside of class with written reports thereon. Prerequisite: course 5. 2d semester, 3 credits.

CHEMISTRY.

1. *General Chemistry.* In this course by a careful and systematic study of the more important non-metallic elements the student is made thoroughly acquainted with the fundamental principles of chemistry. The subject is presented by lectures fully illustrated with experiments, charts, and specimens, by recitations, and by individual experimentation in the laboratory. Particular attention is paid to the underlying theories and the laws of chemistry which are carefully studied at the outset, and equipped with these the student is enabled to explain and correlate the facts as they are learned. In the laboratory the student works not merely to perform a certain number of experi-

ments, but to find answers to questions arising in connection with lecture and class room work. 1st semester, 3 credits.

2. *General Chemistry.* In this course the study of the metallic elements is taken up. The preparation and properties of the more important elements and compounds are illustrated in lectures. References are given to standard texts on inorganic chemistry, and the recitations are based on this reference work as well as on the study of the text book. In the laboratory the qualitative relationships of the metals are studied, preparing the student at the same time for the course in Qualitative Analysis. 2d semester, 3 credits.

3. *Theoretical Chemistry.* This is a study of the laws and theories of chemistry, with especial emphasis upon their applications in the solution of problems, and upon their value in the interpretation of chemical facts. The course may be taken by any student who has completed courses 1 and 2. 1st semester, 2 credits.

4. *Qualitative Analysis.* In the laboratory this includes blow-pipe methods for analysis of solids, methods for getting solids into solution, and group separations of bases and acids. Each student analyses a series of forty "unknowns" covering a wide range of inorganic and common organic substances.

The laboratory course is accompanied by a lecture or recitation period in which methods are given and the reactions studied in the light of the electrolytic dissociation theory, mass law, etc. 1st semester, 3 credits.

5. *Organic Chemistry.* The subject is outlined in a course of lectures giving numerous references to standard texts, and original papers in the journals. By means of class room discussions and frequent quizzes, the library work of the student is encouraged and directed. For those who specialize in chemistry, this is accompanied by the laboratory course. Prerequisites: courses 1 and 2. 2d semester, 3 credits.

6. *Organic Chemical Laboratory.* This course is taken in conjunction with course 5. It includes a study of preparation, separation, and analysis of a number of organic compounds. 2d semester, 3 credits.

7. *Industrial Chemistry.* This course comprises a study of the chemistry of the more common chemical industries. Particular stress is laid on those industries that are of local

importance, and a part of the time is devoted to visiting factories in the vicinity. 1st semester, 3 credits.

8. *Industrial Chemistry Laboratory.* This is taken preferably in connection with course 7. The student repeats manufacturing processes on as large a scale as is possible in a laboratory, and prepares a number of pure compounds from crude materials. 1st semester, 3 credits.

9. *Agricultural Chemistry.* The subject is presented by lectures, text book work, and by supplementary reading. The chemistry of air, soil, and plant and animal life is considered. This course is elective for all students who have completed courses 1, 2, 4, and 5. 1st semester, 3 credits.

10. *Quantitative Analysis.* In the first semester, the student is given the principles of gravimetric analysis by analyzing a carefully selected series of pure compounds. Accuracy is insisted upon and repetitions to produce skill in the manipulation are encouraged. Practice is given in the determination of the constants of the balance and calibration of laboratory glass-ware; and a start is made in volumetric analysis. In a class-room period methods are discussed and the underlying chemistry is kept always in sight. Prerequisites: courses 1, 2, and 4. 1st semester, 4 credits.

11. *Gas Analysis.* A course in gas analysis designed especially for students in Engineering, but open to all others who have completed courses 1 and 2. 1st semester, 2 credits.

12. *Quantitative Analysis.* A continuation of course 10. Acidimetry, alkalimetry, and other volumetric methods are taken up. Complete analysis of limestone, boiler scales, and common alloys are given. Course 10 is a prerequisite. 2d semester, 3 credits.

12a. *Quantitative Analysis.* This course is an extension of course 12 and allows the student to devote additional time to the subject. 2d semester, 2 credits.

13. *Physical Chemistry.* The subject is presented by lectures supplementing the text book. Prerequisites: Chemistry 3, 4, 5, and Physics 1 and 2. 2d semester, 3 credits.

14. *Food Analysis.* Laboratory work in analysis of milk, butter, meats, breadstuffs, and other articles of food. Required of students in Household Economics, but open to others who have completed Chemistry 4, 5, and 10. 2d semester, 3 credits.

15. *Chemical Literature.* A library course in which articles appearing in current chemical preiodicals are studied. Prerequisites: Chemistry 3, 4, 5, 7, and 13. German 1-4. 1st semester, 1 credit.

16. *Special Quantitative Analysis.* In this course the student may take up analysis of special substances such as, sugar-house products, soils, fertilizers, ores, iron and steel, water, etc. Prerequisites: Courses 10 and 12. 1st semester, 3 credits.

17. *Chemical Literature.* A continuation of course 15. 2d semester, 1 credit.

18. *Chemical Research.* The time in this course is to be spent in preparation of a thesis on some subject in pure or applied chemistry. 2d semester, 5 credits.

19. *Special Quantitative Analysis.* This course is a continuation of course 16, or a course parallel to 16, for students who are unable to elect the subject in the first semester. 2d semester, 3 credits.

PHYSICS.

1. *Mechanics and Heat.* A course giving the fundamental notions of work, energy, power, and the units used in measurement; the laws of gases, thermometry, calorimetry, etc. 1st semester, 3 credits.

2. *Magnetism and Electricity, Sound and Light.* This course takes up electrical units, theory of electrical measurements, induction, magnetism of iron, the electro-magnetic theory, and the fundamental laws of wave motion as applied in light and sound. 2d semester, 2 credits.

3. *Electrical Measurements.* A laboratory course making application of the theories of electrical measurements embraced in course 2. It includes measurement of current, voltage, resistance, capacity, magnetic properties of iron, etc. 2d semester, 3 credits.

THE DEPARTMENT OF AGRICULTURE.

The course in Agriculture is designed to give the student information on the essential scientific principles upon which the profession of Agriculture is based. The completion of the four years course does not necessarily imply that the student would be an accomplished agriculturist, for success in agriculture as in all other professions, comes only with the accumulation of experience and the ripening of the judgment dependent upon practice in accordance with existing conditions. In order to engage intelligently in the production of plants and animals or in the management of the soil the student must have an understanding of the sciences of Biology, Physics, and Chemistry, in their relation to the activities of animals, plants, and soils.

The student should be broadly educated not only in natural sciences, but also in mathematics, languages, history, and economics. It is not enough that graduates of this course shall be agriculturists, or farmers, but they must be trained in the affairs of life, have good judgment and be able to recognize agriculture in its many and important relations with business. The object is not so much to train specialists as to give the student intellectual training and sound judgment and understanding in all phases of the field of agriculture. It is designed therefore that the first two years of the course shall consist of subjects pertaining to general culture in order that the students' professional usefulness may be increased. The work of the last two years comprises for the most part, the study of subjects that pertain to the practice of agriculture. The student has the opportunity of choosing subjects that pertain paticularly to the study of crop production or soil management. This course is intended for students purposing to engage in animal breeding, crop production, teaching or research.

Equipment.

Laboratories. The laboratories for physics, chemistry, and biological subjects are well equipped with the requisite apparatus and materials for practice. In most instances individual pieces of apparatus are provided for each student, such as microscopes, physiological apparatus, chemical equipment, and plant material and products.

Lands. The College is now in possession of more than thirty acres of land, most of it being suitable for plantings and demonstration work. Plans are under way for equipping the department with livestock of the several classes and breeds, and especially for promoting commercial poultry and dairy work.

Library. The library contains a large number of volumes which pertain to Agriculture, and more than 7000 pamphlets and Bulletins of the Experiment Stations. The library is constantly receiving additions. Students are encouraged and required to make systematic use of the library in connection with their prescribed courses.

Outline of Course in Agriculture.

	No. of course.	Credits 1st sem.	Credits 2d sem.
English	1 & 2	3	3
German or French	1 & 2	3	3
Mathematics	1 & 2	3	3
Chemistry	1 & 2	3	3
Botany	1 & 2	3	3
Drawing	1a	2	2
2d Year.			
English	3 & 4	3	3
German or French	3 & 4	3	3
Physics	1	3	..
Chemistry	5	..	3
Chemistry	4	3	..
Zoology	1	3	..
Surveying	1 & 2	2	2
Geology	1	..	3
Horticulture	1	..	3
3d Year.			
Bacteriology (Botany)	4	3	..
Agronomy	1 & 2	4	3
Horticulture	2 & 3	3	3
Animal Husbandry	1 & 2	3	3
Entomology	3	..	3
Electives		2	3

4th Year.

History	1 & 2	3	3
Economics	3 & 4	3	3
Estate Management	3	3	..
Rural Engineering	4	..	3
Electives		6	6

Horticulture.

1. *Plant Propagation.* Lectures, recitations, laboratory, field, and library reference work. This course covers methods and principles of propagation of typical plants for both temperate and tropical climates. Propagation by seeds, cuttings, buds, and grafts, with methods of transplanting. 2d semester, 3 credits.

2. *Horticulture.* The work includes the principles underlying the methods of general practice in nursery, orchard, and garden. Presented in the class room by lectures with library references and recitations.

Laboratory and field work includes preparation of soil, use of fertilizers, making and application of spraying mixtures. 1st semester, 3 credits.

3. *Horticulture.* Studies of the classification of tropical and sub-tropical fruits; of varieties, means of identification and variation under different conditions. A portion of the term will be devoted to the study of picking, packing, storing, and marketing of fruits and vegetables. Lectures, recitations, laboratory work, and field work. 2d semester, 3 credits.

Agronomy.

1. *Soils and Cereal Crops.* Lectures, recitations and laboratory work on the types and management of agricultural soils and the cereal crops of the United States. 1st semester, 4 credits.

2. *Local and Miscellaneous Crops.* Lectures, recitations, and laboratory work on Hawaiian field crops, their production and marketing. 2d semester, 3 credits.

Zoology and Entomology.

1. *Invertebrate Zoology.*. Lectures, recitations, field, and laboratory work on the relationships, morphology, habits, and anatomy of invertebrates. 1st semester, 3 credits.

2. *Vertebrate Zoology.* Lectures, recitations, and laboratory work on the relationships, morphology, habits, and anatomy of the vertebrates. 2d semester, 3 credits.

3. *Entomology.* Lectures and readings on the characteristics of the orders, sub-orders, and families of insects. 2d semester, 3 credits.

This course may be extended to 5 credits by electing laboratory work on systematic and economic entomology with reference to habits, methods of reproduction, and control.

Geology

1. *Dynamic and Structural Geology.* Lectures, laboratory, and field work upon the earth's crust materials, their form, structure, and the forces that change them. 2d semester, 3 credits.

Physiology.

1. *Human and Comparative Physiology.* Lectures, and demonstrations on the elements of Physiology with special reference to the relationships in the anatomy of man and animals. Attention is given also to the vital organs with reference to health and disease. 1st semester, 3 credits.

Botany.

1. *Phenogamic Botany.* This course considers the general morphology, physiology, and classification of the seed plants, with special reference to those common to Hawaii. The instruction is designed to give the student training in observation and scientific reasoning.

An endeavor is made to acquaint the student with the economic significance of the plants studied, with references to agriculture. Lectures, recitations, laboratory exercises, and excursions. 1st semester, 3 credits.

2. *Cryptogamic Botany.* General morphology and physiology of spore plants beginning with the simpler forms and giving particular attention to fungi, algae, lichens, mosses, and ferns. Lectures, recitations, laboratory, and field work. Should be preceded by Botany 1. 2d semester, 3 credits.

3. *Dendrology.* A study of the species of trees with reference to their economic uses. Laboratory and field work upon the structure and development of woody plants. 1st semester, 2 credits.

Animal Husbandry.

1. *Breeds of Live Stock.* This course consists of lectures and recitations on the history and characteristics of the different breeds of live stock in addition to practice in scoring and judging animals for special uses. 1st semester, 3 credits.

2. *Breeding and Management.* This course takes up the principles of breeding and the methods of improving the various classes of live stock. Special attention is given to the study of heredity, atavism, fecundity, in-and-in breeding, cross breeding, and a historical study of results. 2d semester, 3 credits.

DEPARTMENT OF ENGINEERING.

The courses in Engineering offered by the College of Hawaii are planned to give thorough training in the fundamental principles upon which professional Engineering practice is based, and to illustrate the application of these principles by the solution of numerous practical problems. These courses embrace the three main divisions of Engineering: Mechanical, Civil, and Electrical, the essential features of each being touched upon sufficiently to provide a good foundation for future practice, upon which the student may take up and follow his chosen branch successfully in a professional way as his fund of practical experience accumulates after graduation. The three courses are parallel for the first two years, the Mechanical and the Electrical continuing the same through the third year, while the course in Civil Engineering diverges from the other two after the second year, the differences being minimized as far as is consistent with thorough training, and the proper administration of the various branches of study. Persons entering these courses are expected to be well grounded in the physical sciences and in mathematics up to, and including, solid geometry and plane trigonometry. (See Entrance Requirements pp 15 and 20). It is desired to emphasise the necessity of thorough preparation in order that the more serious work of mastering technical subjects may not be hampered by lack of proper ground work.

The general plan provides a broad foundation in English, mathematics, chemitsry, and physics, accompanied by drawing and shop work during the first two years. Realizing the value of general culture to the successful engineer, liberal provision has been made for the Humanities, including a study of English, history, astronomy, and political economy, with a view to their influence upon the student's future professional usefulness. The work of the last two years is more technical and professional in its nature, embracing the study of the principles involved in power development by means of the various prime movers including steam engines, water wheels, gas and gasoline engines, and steam turbines; and also a critical study of the design of such ma-

chines, and of the materials entering into their construction as well as practical tests to determine their working efficiency, and economy of operation. It is the aim of the department to fit its graduates to assume gradually as practical experience is acquired, those administrative responsibilities which are more and more devolving upon men of technical training, the purpose being to enable the student to become ultimately a skillful practical engineer in any branch. So far as possible, the importance of each subject covered is illustrated by the application to some work which is met with in actual practice. It is intended that the courses offered should be valuable not only from the professional side, but also from an educational viewpoint; therefore, while the student is learning each subject both theoretically and practically the training of his mind, as well as the needs of the profession are kept in view.

Equipment.

Drawing. The drawing room equipment includes a number of first class adjustable tables of large size, fitted with all accessories, complete for work; also an extensive outfit for blue printing, and many special instruments, such as parallel attachments for tables, railroad curves, splines, protractors, planimeters, special scales, drafting machines, and computing instruments. The library of the College contains a special section on the general subject of Mechanical Drawing, which is accessible at all times for student use.

Laboratory. The College at the present time is constructing a building for the accommodation of the pattern making and forge rooms. The equipment for wood working and pattern making embraces ten pattern makers' benches, each equipped with a full complement of tools for the regular use of the students, with many special tools for illustrative purposes; also a number of machine tools for wood working, including a band saw, scroll saw, grinding machine, universal saw bench, hand planer, surfacing planer, boring machine, universal trimmer, a number of small wood lathes, and a large pattern makers' lathe. The equipment is designed to conform to the best practice in such work, in that the machinery is arranged in groups, and is driven throughout by electric motors, thus

giving the student correct ideas upon proper arrangement and operation.

The forge equipment is arranged on the down draft plan and embraces ten sets of forges and anvils, with complete outfits of tools, specially adapted to the work of instruction. The forges are served by a common pressure blower and a separate exhauster each of which is operated by an individual electric motor drive.

Testing Laboratory. In connection with the woodworking and forge laboratory, the College is constructing a testing laboratory, for materials of construction, including wood, iron, steel, and cement, and providing also facilities for fuel testing. The equipment of the testing laboratory includes a 150,000 lb. capacity Reihlé universal testing machine with automatic and autographic attachments, for tension, compression, and transverse tests of large specimens; a small Reihlé machine for testing specimens up to 10,000 lb. in transverse strain; a torsion machine by Olsen for torsion tests up to 50,000 inch lbs.; a special Olsen machine of 40,000 lb. capacity for compression tests of cement and concrete cubes; and a standard Reihlé 2,000 lb. machine for briquettes. These machines are provided with a complete assortment of the necessary special instruments such as extensometers, compressometers, deflectometers, and gauges, thus making possible the accurate measurement of deformation over a wide range of tests. In addition to the above, the testing laboratory also includes an extensive equipment of molds, sieves, Vicat needles, moist closets, drying ovens, and other minor accessories necessary to carry out practical tests of cements and concrete in any of the usual forms.

Library. Students in Engineering are encouraged and required to make frequent and continuous use of the library in connection with the regular courses of instruction. The library contains a large and well selected collection of standard technical books besides many periodicals pertaining especially to Engineering. The collection includes sets of the Transactions and Proceedings of the four National Engineering Societies, together with bound volumes of the Engineering News back to, and including, the year 1890, which taken together,

constitute an excellent working library of current practice in each of the main branches of Engineering.

MECHANICAL ENGINEERING.

The course in Mechanical Engineering is designed to afford training in general engineering, covering in addition thereto, the more purely mechanical subjects, exercises in electrical measurements and testing, in chemical technology, in hydraulics, in sugar engineering, and in the engineering of power plants. This general scope of subjects affords insight into actual industrial and engineering practice and to this end the collateral training of the faculties is insured by courses in the laboratories, work shops and the drafting room. Engineering graduates often begin their professional life in a drafting office, and to fit them for this work the training in mechanical drawing is designed to develop accuracy, speed, order, and neatness. In the drafting room the student learns to make working drawings and blue prints of machine parts and engineering structures, and finally works out original designs. Instruction in the shops and laboratories gives familiarity with materials and mechanisms, skill in handling tools and appliances, an understanding of the practical possibilities of machinery and processes, and an acquaintance with shop and laboratory limitations affecting the principles of design and manufacture. The course thus embraces, in addition to theoretical training, the use of tools and the value of different methods of executing work from the standpoint of economic construction.

General Outline. (Mech. Eng.)

1st Year.

	No. of course.	Credits 1st sem.	Credits 2d sem.
English	1 & 2	3	3
German or French	1 & 2	3	3
Mathematics	3	5	..
Analytic Geometry	4	..	5
Chemistry	1 & 2	3	3
Drawing	1	2	2
Wood Technology	1	2	2

2d Year.

English	3 & 4	3	3
German or French	3 & 4	3	3
Physics (General)	1 & 2	3	2
Calculus	5	3	..
Calculus	6	..	3
Surveying	1	2	2
Drawing	2	2	..
Drawing & Descriptive Geometry	3	..	3
Foundry Practice	2	2	..
Forging	3	..	2

3d Year.

Mechanics (Analytical)	2	4	..
Mechanics (Structural)	3	..	3
Metallurgy	3	..	2
Materials	2	2	..
Kinematics	4	3	..
Machine Design	5	..	3
Chemistry	11	2	..
Physics (Laboratory)	3	..	3
Steam Machinery	1	3	..
Electrical Machinery	1	..	3
Mechanical Laboratory	1	2	2
Machine Work	4	2	2

4th Year.

Thermodynamics	4	3	..
Steam, Gas, and Oil Engines	5	..	3
Steam Engine Design	7	2	..
Power Plant Design	7	..	2
Dynamo Laboratory	3	2	..
Political Economy	4	..	3
Hydraulics	7	3	..
Engineering Laboratory	2	2	..
Power Plant Testing	3	..	2
Specifications and Contracts.	8	..	2
Engineering of Sugar Plants	6	..	2
Psychology	1	3	..
Electives		3	4

Synopsis of Courses.

Mechanic Arts (m. a.)

1. *Wood Technology.* A course in woodworking comprising the operations of planing, rabbeting, plowing, notching, splicing, mortising, framing, dove-tailing, laying out work, and the general use of carpenters' tools, followed by practice in wood turning with special reference to manufacturing operations, and the construction of patterns for foundry work. Practice is given in the use of woodworking machinery as an aid to rapid and accurate work. Instruction is given by lectures at the beginning of the periods, and is followed by the actual work under the supervision of the instructor. Freshmen. 2 semesters, 2 credits.

2. *Foundry Practice.* A course including the various operations of molding, core-making, and the melting and pouring of iron and brass, which is supplemented by lectures on special processes, machine-molding, and general foundry practice. Each student is required to make a suitable number of acceptable castings from patterns previously made in the pattern shop. Requires m. a. 1 and m. d. 1. Sophomores. 1st semester, 2 credits.

3. *Forging.* A course which includes upsetting, swaging, punching, bending, drawing out, forming, and welding. Practice is given in the working and tempering of the various kinds of steel, with special reference to its use for cutting tools for wood and metal working. Each student is required to forge and temper a complete set of chisels and lathe tools for his own use in the machine shop. Requires m. a. 1 and m. d. 1. Sophomores. 2d semester, 2 credits.

4 *Machine Work.* A course which includes vise work, filing, chipping, drilling, tapping, key-seating, laying out work from dimensioned drawings, and hand work on machine tools. This is followed by work on lathe, planer, drill-press, milling machine, and universal grinder, involving such operations as cylinder boring, gear cutting, the making of taps and reamers, and the machining of special machine parts in iron and steel. Instruction is given in the use of jigs and templates, and in

methods for rapid and economical production of work. Requires M. A. 2 and 3, M. D. 2. Mech. & Elect. Engrs. 2 semesters, 2 credits.

Drawing and Machine Design (M. D.)

1. *Mechanical and Free Hand Drawing.* An elementary course which includes free hand sketching, free hand lettering, use of instruments, conventional sections, drawing from copies and models, (using parts of machines from the Mechanical Laboratory as models), the making of shop drawings, tinting and shading, tracing, and blue-printing; in which particular attention is given to lettering, general neatness, and accuracy. Text: Jamieson's "Elements of Mechanical Drawing." The cost of materials and instruments required is about $30.00. Freshmen. 2 semesters, 2 credits.

1a. *Mechanical and Free Hand Drawing.* A course in drawing following the same general plan as M. D. 1, but designed especially to fit the needs and requirements of students in Agriculture, and covering the following: Free hand sketching from models of agricultural tools and apparatus, practice in free hand lettering, the use of drawing instruments, the making of working drawings, tracing, and blue-printing. The cost of materials and instruments required is about $20.00. Freshmen or Sophomores in Agriculture. 2 semesters, 2 credits.

2. *Mechanical Drawing.* A second year course, following M. D. 1 covering the drawing of machine parts and complete machines to scale and the design of machine details. Text: Jamieson's "Advanced Mechanical Drawing." Requires M. D. 1 and Math. 3 and 4. Sophomores. 1st semester, 2 credits.

3. *Drawing and Descriptive Geometry.* A course covering the study of Descriptive Geometry, with special reference to its application to practical work in the drawing office, embracing lectures and drawing room practice in which a large number of problems of a practical nature are worked out. Requires M. D. 2 and Math. 3 and 4. Sophomores. 2d semester, 3 credits.

4. *Kinematics.* A third year course dealing with the velocity ratios of various motions, the construction of gears, cams, quick-return motions, and the design of trains of mechanism. Special attention is paid to methods of calculation, and the use of computing devices, as an aid to rapid work. Lectures and drawing room exercises. Requires M. D. 2 and Math. 5 and 6. Junior Mech. and Elect. Engrs. 1st semester, 3 credits.

5. *Machine Design.* A course in the class room and drafting room covering the calculation of strength and stress, the principles of design of machine parts; the general features involved in the arrangement of conveying and transmission systems, the computation of machine details, unit working stresses, and the relation of design to shop possibilities and shop practice.

Each student is assigned problems for actual computation from the principles of this and preceding courses. Solutions of problems must be comprehensive, with view to strength of parts, adjustment, accessibility, cost of maintenance, appearance, cost of production, and interchangeability. All proportions must be determined from the fundamental principles involved. Text: Unwin's "Machine Design," Parts I and II. Requires M. D. 4. Junior Mech. and Elect. Engrs. 2d semester, 3 credits.

6. *Topographical Drawing.* A course embracing the use of topographical signs and conventions, hill shading by different methods, the representation of surface forms by contour and by the use of color, pencil, and charcoal; the making of topographic maps, copying, enlarging, and reducing maps. The course also includes practice with special labor-saving devices, such as planimeters, pantographs, splines, curves, and drafting-machines. This course should be taken with, C. E. 4. Requires M. D. 2 and Math. 5 and 6. Junior Civil Engrs. 2 semesters, 3 credits.

7. *Steam Engine Design.* A course in the drafting room, supplemented by lectures and library reference, covering the calculation and design, together with complete assembly and detail drawings, of a steam engine for a given power and specified service. Requires M. D. 5, C. E. 2 and 3. This course should be taken with M. E. 4. Senior Mech. Engrs. 1st semester, 2 credits.

Mechanical Engineering (M. E.)

1. *Steam Machinery.* A course in which the fundamental laws, governing the transformation of heat into work are presented and discussed, embracing the properties of gases, laws of expansion, heat measurement, the mechanical equivalent of heat, properties of steam, construction and study of steam tables, and heat analysis as applied to steam and internal combustion engines. The solution of a large number of problems of a practical nature is required. Lectures and recitations. Requires Math. 5 and 6, M. D. 2. Junior Mech. and Elect. Engrs. 1st semester, 3 credits.

2. *Materials of Engineering.* A course of lectures and recitations on the properties and requirements for materials used in engineering construction, including wood, iron, steel, and concrete. Methods of manufacture as affecting quality of material, standard tests employed to secure the proper grades of material, and standard specifications, are touched upon. Requires Math. 5 and 6, M. D. 2. Juniors. 1st semester, 2 credits.

3. *Metallurgy.* A course in general metallurgy covering all the common metals, the processes and methods of reducing the metals from their ores, and methods of refining. The manufacture of iron and steel is given special attention. Requires M. E. 2, C. E. 2. Juniors. 2d semester, 2 credits.

4. *Thermodynamics.* A course following M. E. 1 in which the principles of thermodynamics are applied, to the study of heat motors and steam machinery involving: the behavior of steam in the cylinder, compression, clearance, cylinder condensation, re-evaporation, jacketing, super-heating, ratio of expansion, indicator diagrams and analysis, combined diagrams from multiple expansion engines, mechanical efficiency, proportions for compound engines, cylinder ratios, distribution of work, drop in receivers, re-heating, and the calculations for the complete design of an engine for stated conditions. (This may be done in connection with the course in Steam Engine Design M. D. 7, in such a way as to combine calculations and avoid duplication of work. The lectures accompanying the course include methods of lubrication, valves and valve gears,

link motions, valve diagrams, analysis of crank effort, counterbalancing, friction and inertia effects, methods of testing, efficiencies, shop practice in assembly and erection, commercial types, and standard forms for power plant and mill work. Requires M. E. 1, C. E. 2 and 3. Senior Mech. and Elect. Engrs. 1st semester, 3 credits.

5. *Steam, Gas, and Oil Engines.* A course dealing with special types of steam engines and steam turbines; internal combustion engines and details pertaining thereto as follows: fuel gases and fuel oils, their physical properties and calorific values; the various gases suitable for power and methods of producing them; the gas engine cycle, and the historical development of internal combustion engines, gas and gasoline engines, limitations of efficiency, indicator diagrams, gas engine auxiliaries, and applications of gas power; mechanisms for control of air, ignition, and regulation. The use of alcohol for power, modern types of engines, problems in design, methods of cooling, valves and valve gears and efficiency tests are other points touched upon, which are followed by discussion of special applications; the automobile engine, arrangement of cylinders, actual capacity, carburetors, transmission gears, the driving of electric generators; general economic considerations, influence of cost of fuel and plant cost on choice of prime movers; comparison of reciprocating, turbine, and gas power plants. Requires M. E. 4. Senior Mech. and Elect. Engrs. 2d semester, 3 credits.

6. *Engineering of Sugar Plants.* A lecture and drafting room course involving the application of the fundamental principles of engineering practice to modern sugar works including grinding and evaporating machinery, boiler and engine plant, conveying machinery, industrial railways, arrangement of buildings, layout of plant, and other general and special engineering considerations affecting the making and refining of sugar. Requires M. E. 4. Senior Mech. Engrs. 2d semester, 2 credits.

7. *Steam Plant Design.* A drafting room and lecture course on steam power generating machinery with reference to plant design touching upon such considerations as: location of plant with respect to fuel and water supply, influence of load

factor and first cost upon design; fuels, their properties and analysis, theory of combustion, stoking, steam boiler economy, types of boilers and calculation of capacity, design of boiler settings, furnaces for special fuels, oil burning, smokeless combustion, mechanical stokers, boiler fittings, draft and air supply, chimneys, forms of forced draft equipment, superheaters, economizers, feed pumps, injectors, feed water heaters, condensers; steam, exhaust, and water piping systems; pipe covering, water purification, coal handling and storage, plant economy, cost of power, specifications for fuel, operation of plants, care of steam boilers, and the general relations of power plant design to electrical engineering practice. Requires M. E. 4. Senior Mech. and Elect. Engrs. 2d semester, 2 credits.

8. *Contracts and Specifications.* A course of lectures on contracts touching upon points likely to be of value to engineers, together with such principles of law as should be understood by the engineer who is entrusted with the drawing of contracts. The lectures are followed by a detailed study of typical contracts and specifications for engineering work of various kinds. Requires M. E. 4 or C. E. 7. Senior Mech. and Civil Engrs. 2d semester, 2 credits.

Engineering Laboratory (X. E.)

1. *Mechanical Laboratory.* A lecture and laboratory course; the lectures covering the general method of measurement and testing, methods of recording data and computing results, forms for reports, factors affecting efficiency, and the equipment required for various physical tests; laboratory practice including the use of engineer's computing devices; the ordinary slide rule, the Fuller spiral rule, the Thatcher rule, and Goodchild chart, the calibration of gauges, thermometers, scales, and indicator springs; the testing of lubricants, indicator and planimeter practice, tension, compression, and transverse tests of iron and steel; the calorimetric determination of heating value of fuels, tests of steam calorimeters, dynamometer tests, hydraulic ram, and water meter tests, water wheel tests, and the efficiency of steam boiler and simple steam engine. Requires M. A. 2 and 3. Math. 5 and 6, M. D. 2. Junior Mech. and Elect. Engrs. 2 semesters, 2 credits.

2. *Engineering Laboratory.* A course of lectures and laboratory practice following x. e. 1 and consisting of economy tests of boilers, engines, blowers, and transmission gearing; valve setting, injector tests, determination of heat loss in piping system, combined cards from multiple expansion engines; specific heats of brines, heat transfer through submerged coils, test of an ice making plant, road test of a locomotive and similar exercises as opportunity may arise. The student records his observations in a note book in the laboratory, and later submits computation, and description of test in the form of a written report, accoompanied by graphical logs, curves, and tabulations of data and results, with the conclusions arrived at. Requires x. e. 1, m. d. 5, c. e. 2 and 3. Senior Mech. and Elect. Engrs. 1st semester, 2 credits.

3. *Power Plant Testing.* Lectures on the general features of plant testing, illustrating the proper methods to be followed in given tests for plant economy, accompanied by actual tests of electric power installations in or near the city of Honolulu. Such tests involve the accurate measurement of fuel and water consumed with measurements of the output from which the efficiency of the plant is determined. All results are presented in the form of a written report containing log, computations, curves, and conclusions. Requires x. e. 2. Senior Mech. and Elect. Engrs. 2d semester, 2 credits.

4. *Materials Laboratory.* A course of laboratory practice in testing the materials of construction, involving complete tests of specimens of wood, iron, steel, and concrete in their various forms. Special attention is given to the preparation and testing of specimens of concrete both plain and reinforced in the form of cubes, columns, beams, and girders. The facilities available for such work are ample and the instruction given covers a large number of practical tests thus affording the student valuable means of familiarizing himself with the behavior of such materials under stress. Requires c. e. 2, 3, and 5. Senior Civil Engrs. 1st semester, 2 credits.

CIVIL ENGINEERING.

The College recognizes this branch of Engineering as at once the oldest and broadest of the engineering professions, comprising as it does, Municipal Engineering with its problems of water supply, sewage disposal, and highway construction; Hydraulic Engineering with its questions of irrigation and water power development; Structural Engineering, dealing with the design of bridges, steel, and concrete buildings, roofs, foundations, and retaining walls; and Transportation Engineering, including the building of railways, canals, docks, and tunnels, This wide range of subject cannot be covered in detail in a four year course, hence the student's attention is concentrated upon the comparatively few principles underlying the various branches of the profession, and he is given every facility for mastering them by continuous drill in the class room and in the laboratory. He is taught that knowledge when not accompanied by the ability to use it, is of small value, while accuracy and neatness in drawings and computations are an invaluable aid. The details and cost of construction are dwelt upon sufficiently to impress the student with their importance in the problems of design with special regard to theory and economy.

The course in Civil Engineering is identical with that of Mechanical Engineering throughout the freshman and the sophomore years. The divergence of the course begins at the opening of the junior year and continues throughout the last two years, special attention being paid during this latter period to the more practical subjects, such as surveying, irrigation, sanitary engineering, water supply, and bridge design.

General Outline (Civil Eng.)

3d Year.

	No. of course.	Credits 1st sem.	Credits 2d sem.
Mechanics (Analytical) ...	2	4	..
Mechanics (Structural) ...	3	..	3
Materials	2	2	..
Metallury	3	..	2
Geology	1	..	3
Astronomy (Math.)	7	3	..
Bacteriology	4	3	..
Structural Design	5	..	3
Surveying	4	3	4
Drawing	6	3	3

4th Year.

Contracts and Specifications	8	..	2
Hydraulics	7	3	..
Irrigation and Water Supply	8	..	3
Municipal and Sanitary Engineering	9	3	..
Bridge Design	6	..	2
Surveying	10	3	..
Roads and Highways	11	..	2
Materials Laboratory	4	2	..
Political Economy	4	..	3
Concrete and Masonry Structures	12	..	2
Psychology	1	3	..
Dendrology and Timber Technology	3	2	..
Electives		2	4

Synopsis of Courses.

Civil Engineering (C. E.)

1. *Surveying.* A course in plane surveying, supplemented by lectures and drafting room exercises. The student is taught the use of the chain, tape, compass, transit, and level, and is given extended practice in the manipulation of these instruments in the field. The drafting room work includes practice in the computations that the surveyor is called upon to make as well as plotting from original notes. Requires M. D. 1 or 1a, Math. 1 and 2, or 3 and 4. Sophomores in Engineering and Agriculture. 2 semesters, 2 credits.

2. *Analytical and Applied Mechanics.*. A course designed to emphasise the fundamental principles of the various branches of applied mechanics and to familiarize the student with the use of higher mathematics in the solution of problems relating to engineering work. The courses includes the study of analytical statics, composition and resolution of forces, application to rigid bodies, centers of gravity, centers of mass, friction, work, flexible cords, funicular polygon, the catenary, and loaded chords, embracing a large number of problems to illustrate special and general methods of solution. The analytical theory of kinetics is developed, and special attention is given to the laws of motion, variable forces, constrained motion, central forces, impact, energy, dynamics of prime movers, moments of inertia, rotary motion, and the simple and compound pendulum. Text: Church's "Mechanics of Engineering." Requires Math. 5 and 6, M. D. 2. Juniors. 1st semester, 4 credits.

3. *Structural Mechanics.* A course which treats of the resistance and elasticity of materials in tension, compression, and shearing stress, and covering the study and calculation of riveted joints, simple beams, cantilevers, restrained beams, safe loads, elastic curves, deflections, beams of uniform strength, columns, temperature stresses, and horizontal shear in beams, embracing the solution of numerous practical problems. This course should be taken simultaneously with C. E. 5. Text: Merriman's "Mechanics of Materials." Requires C. E. 2. Junior. 2d semester, 3 credits.

4. *Surveying.* A course covering accurate methods of measuring angles and distances, contouring and grading, street grading, city survey and measurements, and the general methods of surveying employed in mining. Text: Raymond's "Plane Surveying," and Johnson's "Theory and Practice of Surveying." Requires Math. 5 and 6, C. E. 1. Junior Civil Engrs. 2 semesters, 3 and 4 credits.

5. *Structural Design.* A lecture and drawing room course in which the student computes the stresses and designs the members for a plate girder bridge, and a steel building truss. The work includes the making of complete detail drawings and specifications, is done under close supervision, and is carefully checked.

The important general points are covered by lectures, minor points being taken up with individual students during the progress of the work. Text: Merriman and Jacoby's "Roofs and Bridges" parts I and II. Requires C. E. 3. Senior Civil Engrs. 2d semester, 2 credits.

6. *Bridge Design.* A lecture and drawing room course following C. E. 5 and covering the complete design of a single track through bridge for a given conventional loading and including all computations, the making of complete engineer's drawings, and the specifications. Text: Merriman and Jacoby's "Roofs and Bridges." Parts II and III. Senior Civil Engrs. 1st semester, 2 credits.

7. *Hydraulics.* A lecture and recitation course covering the more important principles of hydraulics which govern and treat of fluids at rest; hydrostatic pressure, manometers, and Pitot tube, Venturi meter, strength of pipes, pressure of water against walls and dams, earth pressure, barometric leveling, flow of liquids through pipes and over weirs, fluid friction, loss of head, flow of water in open channels, Kutter's formula, impulse and resistance of fluids, the Pelton water wheel, overshot, breast and undershot wheels; turbines and reaction wheels, and the general practice of turbine testing.

The laboratory practice accompanying this course includes the gauging and measurement of flow in channels and over weirs; tests of water motors of various types, tests of hydraulic

rams, and pumping machinery of various kinds. Text: Merriman's "Treatise on Hydraulics." Requires C. E. 2 and 3. Seniors. 1st semester, 3 credits.

8. *Irrigation and Water Supply.* A course of lectures and recitations covering the general study of precipitation, run-off, stream flow, measurement of flow, head works, storage reservoirs, and distributing systems for irrigation plants, and dealing also with the principal features of water supply engineering, including source of supply, hydraulics of wells, impounding and storage, pipe lines and conduits, pumps and pumping machinery, stand-pipes and elevated tanks, distributing systems, and tests for purity of water. Seminar and written reports on specific topics. Requires Bacteriology 4. C. E. 2 and 3. Senior Civil Engrs. 2d semester, 3 credits.

9. *Municipal and Sanitary Engineering.* A course similar to Irrigation and Water Supply C. E. 8 but dealing with the principles and problems relating to sewage disposal, and the general questions concerning Municipal Engineering, including a study of the following topics: sanitary necessity of sewerage; the various systems, surveys and general plans; hydraulics of sewers; house sewage and its removal; relation of rainfall to storm water flow; calculation of size and capacity of sewers; forms and strength of sewer details; methods of sewage and garbage disposal; and estimates and specifications. Text: Folwell's "Sewerage." Requires Bacteriology 4. C. E. 2 and 3 Senior Civil Engrs. 1st semester, 3 credits.

10. *Surveying.* Lectures and field work involving the theory and use of the stadia, plane table, solar transit, and sextant. Students are required to make and reduce observations illustrating the work of the course which includes, base-line measurements, triangulation, field methods for time, latitude, longitude, and azimuth, and brief practice in railway location. Requires C. E. 2, 3, and 4. Senior Civil Engrs. 1st semester, 2 credits.

11. *Roads and Highways.* A lecture and recitation course treating of the location of country roads; earthwork, drainage, culverts, retaining walls, highway bridges; the reconstruction and improvement of highways, the general principles and methods of construction of earth, gravel, and macadam roads; and the durability, desirability, and cost of the various kinds

of pavements. Text: Baker's "Roads and Pavements." Requires C. E. 2, 3, 4. Senior Civil Engrs. 1st semester, 2 credits.

12. *Concrete and Masonry Structures.* A course treating of the properties of stone, brick, and concrete and their uses in engineering structures such as foundations, retaining walls, piers, abutments, and dams; including the design of arches and dams in stone, and the design of reinforced concrete structures such as beams, girders, columns, floor slabs, and highway bridges. Lectures and drawing room work supplemented by library reference. Requires C. E. 2, 3, 4. Senior Civil Engrs. 2d semester, 2 credits.

ELECTRICAL ENGINEERING.

The course in Electrical Engineering is intended to give the training required by men who wish to take up, professionally, the applications of electricity to the useful arts, and is designed to give special preparation to any person who may be concerned with its commercial activities, including electric railways, telephones, electric lighting, electro-metallurgy, and the generation, transmission, and utilization of electric power. The large amount of laboratory work required aims to educate the student in accurate observation, proper order, and form in recording observations, the drawing of correct inferences, and the setting forth of his work in good English, and also to impart such a knowledge of Electrical Engineering as will fit him to enter any of its branches. Sufficient practice is given in the handling of dynamos and electrical machines and instruments to enable the student to carry out independently any tests or measurements likely to occur in actual practice. The importance of details is impressed upon him by the solution of numerous practical problems in constructive engineering and design, working drawings being required where necessary. Students who purpose entering this course should be well grounded in mathematics and physics as no student deficient in talent for mathematics, physics, or the mechanic arts should attempt a course in Electrical Engineering. The freshman, sophomore and junior years are identical with the course in Mechanical Engineering; in the Senior year, laboratory work

is increased and practical work in Electrical Engineering is introduced.

General Outline (Elect. Eng.)

4th Year.

	No. of course.	Credits 1st sem.	Credits 2d sem.
Thermodynamics	4	3	..
Steam, Gasoline, and Oil Engines	5	..	3
Electrical Machinery Design	2	2	..
Power Plant Design	7	..	2
Engineering Laboratory . . .	2	2	..
Dynamo Laboratory	3	2	..
Hydraulics	7	3	..
Electro-metallurgy	4	..	2
Power Plant Testing	3	..	3
Political Economy	4	..	3
Psychology	1	3	..
Electives		3	5

Synopsis of Courses.

Electrical Engineering. (E. E.)

1. *Electrical Machinery.* A course covering the fundamental principles which govern the design and operation of dynamo-electric machinery and the theory and construction of armatures, field magnets, and commutators of direct current generators, motors, motor-generators, boosters, and regulators. This is followed by a brief treatment of alternating current machines, transformers, and transmission systems. Methods of calculation, graphical analysis, and the solution of practical problems are a special feature of the course which should be taken simultaneously with Physics 3. Requires Math. 5 and 6, Physics 1 and 2, M. E. 1. Junior Mech. and Electrical Engrs. 2d semester, 3 credits.

2. *Electrical Machinery Design.* A lecture and drawing room course following E. E. 1, treating of the principles of

alternating and direct current machinery and of their application to problems in design, embracing dynamos, motors, transformers, and transmission systems. Requires E. E. 1, C. E. 2 and 3. Senior Elect. Engrs. 1st semester, 2 credits.

3. *Dynamo Laboratory.* A course of laboratory practice involving the handling and testing of dynamos, motors, alternators, transformers, storage batteries, and other electrical machinery, and covering a wide range of experiments along practical lines. Requires E. E. 1, C. E. 2 and 3. Senior Elect. Engrs. 1st semester, 2 credits.

4. *Electrochemistry and Metallurgy.* A course covering the principles of physical chemistry so far as applicable in the electrolytic extraction and refining of metals, the electrolytic manufacture of chemical compounds, and the theory and practice of storage cells. The course consists of lectures and laboratory practice. Requires Chem. 11, Math. 5 and 6, E. E. 1. Senior Elect. Engrs. 2d semester, 2 credits.

DEPARTMENT OF HOUSEHOLD ECONOMICS.

There is an increasing appreciation of the fact that much that relates to the Home may be studied scientifically not only for the practical value of the knowledge thus gained, but as a means to a liberal education. While the main work offered in this course is scientific and technical, the importance of an artistic and literary training for home life is not lost sight of, and ample opportunity is given for the study of subjects of this character by electives and required work in Mathematics, Languages, and the Humanities. The course thus allows opportunity for students to obtain training along both scientific and artistic lines.

Domestic Science and Art Training. In this course which is offered in response to a demand for training along this line, manual skill has not been ignored although intellectual training and development is the main object in view. Equal stress is laid upon food, clothing and shelter, from a scientific and an artistic point of view. For graduation one hundred and twenty-eight credits are required.

Recognizing the place of art training in the broad education now offered by the best institutions, the College has provided for well defined courses in Art and Design, with special reference to Ceramics.

The aim of the department is to enlarge the resources of its students along both practical and aesthetic lines. The men and women of to-day who are being trained in the sciences of agriculture and mechanic arts live in close touch with nature. They require that training of the artistic sense which will enable them to appreciate and apply those principles of fitness, harmony, and proportion which are manifested in nature. The refinement of taste and the development of the power of discrimination is especially helpful in the home. Hence the work in art is being adapted to the requirements of students in Household Economics.

A knowledge of drawing is fundamental. The course provides for the study of line, form, (in the abstract and concrete), and light and shade. Various mediums of expression are used, (pencil, charcoal, brush, etc.), thus leading to freedom as well as accuracy in work, and a directness which is invalu-

able in the color course which follows. The class will be instructed in the application of original designs to suitable forms and materials. The work in Ceramics embraces the study of good forms in porcelain, as well as that of refined decoration.

Block-printing and stenciling upon textiles, leather tooling, metal work, etc., will be employed for the practical working out of approved designs. In addition to the above, a course in the History of Art is offered. The subjects of architecture, sculpture, and painting, will be considered as a means of cultivation in art appreciation and art criticism.

Equipment. The department has a well equipped kitchen and dining room which facilitate instruction in the preparation and serving of food according to the best scientific and artistic methods. The kitchen range is fitted with a separate gas meter for measuring the consumption of gas in cooking.

The art department has a good equipment in casts, models, and designs in pottery, and a modern kiln for pottery firing. Plans and charts pertaining to home architecture are being added to the collection of reference books in the Library.

Outline of Course in Household Economics.

1st Year.

	No. of course.	Credits 1st sem.	Credits 2d sem.
Mathematics	1 & 2	3	3
English	1 & 2	3	3
German or French	1 & 2	3	3
Chemistry	1 & 2	3	3
Botany	1 & 2	3	3
Drawing, (Art and Design)	1 & 2	2	2

2d Year.

English	3 & 4	3	3
German or French	3 & 4	3	3
Chemistry	4 & 5	3	3
Zoology	1	3	..
Art and Design	3, 4, & 5	2	3
Household Economics	2 & 3	3	3

3d Year.

Botany	4	3	..
Chemistry	10 & 14	4	3
Physiology	1	3	..
Entomology	1	..	3
Household Economics	4 & 5	3	3
Electives		2	6

4th Year.

History	1 & 2	3	3
Economics	3 & 4	4	3
Household Economics	6 & 7	3	3
Household Economics	8	..	3
Psychology	1	3	..
Electives		3	3

Synopsis of Courses.

Household Economics.

1. *Personal Hygiene and Sanitation.* This course aims to instruct the student in the care of the individual, in his relation to environment, the transmission of diseases, what to do in emergency. Lectures with references to works on hygiene and physiology. 2d semester, 2 credits.

2. *Textiles.* A study of the characteristics of different fibers, fabrics, and dyes. Application of principles of design to dress. Principles of cleaning fabrics. Lectures and laboratory practice. One dress will be made by each student. Prerequisites: Art and Design 1 and 2. 1st semester, 3 credits.

3. *Selection and Preparation of Food.* The nature and the uses of food; its chemical composition; changes effected by heat, cold, and fermentation. Excursions to market. Lectures and quizzes. Laboratory practice in cooking. Prerequisites: Chemistry 1, 2, 4, 5. 2d semester, 3 credits.

4. *Economic Uses of Food.* This course is a continuation of Course 3. Emphasis is laid upon the economic uses of food.

Lectures and quizzes. Laboratory practice in cooking. Prerequisite: Household Economics 3. 1st semester, 3 credits.

5. *House Construction, Sanitation, and Decoration.* The lectures in this course will include discussion of building sites, house plans, building materials, water supply and drainage, plumbing, heating, lighting, ventilation, decoration, and furnishing. Laboratory practice in drawing of plans and in decoration. Prerequisite: Art and Design 1, 2, 3, 4, 5, 6. 2d semester, 2 credits.

Art and Design.

1. *Freehand Drawing.* Study in type models and drawing in outline and light and shade from ornament, natural objects and casts, freehand perspective. 1st semester, 2 credits.

2. Freehand Drawing. Memory sketching; drawing of plant forms and still life groups in charcoal for the study of composition; casting drawing. Prerequisite: course 1. 2d semester, 2 credits.

3. *Color.* Theory of color; consideration of color values and harmony through the medium of water colors, using plant forms, still life, and landscape as subjects. Prerequisite: course 2. 1st semester, 2 credits.

4. *Color and Design.* Study of line, dark and light, and color with emphasis upon design; decorative composition. Prerequisite: course 3. 2d semester, 2 credits.

5. *History of Art.* Architecture: Egyptian, Assyrian, Greek, Roman, Byzantine, Romansque, Gothic, and Renaissance. The course will include both lecture and text book work. 2d semester, 1 credit.

6. *History of Art.* Sculpture: and painting. 1st semester, 1 credit.

7. *Ceramic Design and Porcelain Decoration.* Prerequisite, Course 4. 1st semester, 2 credits.

8. *Ceramic Design and Porcelain Decoration.* Prerequisite, course 7. 2nd semester, 2 credits.

STUDENTS.

Students in Regular Courses.

Ching Quon Amona	*Eng.*	Honolulu, Oahu.
Huron Ashford	*Agr.*	Honolulu, Oahu.
Leslie Clark	*Agr.*	Honolulu, Oahu.
Chi Bui Farm	*Agr.*	Honolulu, Oahu.
Dexter Fraser	*Eng.*	Honolulu, Oahu.
Robert Hendry	*Eng.*	Honolulu, Oahu.
Horald Johnstone	*Eng.*	Honolulu, Oahu.
Jay M. Kuhns	*Agr.*	Honolulu, Oahu.
Valentine Marcallino	*Sci.*	Honolulu, Oahu.
Wm. Meinicke	*Agr.*	Waiohinu, Hawaii.
Edward Tracy	*Eng.*	Honolulu, Oahu.
A. R. Tulloch	*Sci.*	Honolulu, Oahu.
Fook T. Yong	*Eng.*	Maunawai, Oahu.

Students in Special Courses.

Alexander, Agnes
Ballentyne, Marie
Blanchard, E.
Burt, Uarda
Buchley, Mrs. R.
Campbell, Mrs. Marston
Center, Nadine
Cooke, Grace
Coombs, Mrs. Walter
Damon, Mrs. E. E.
De Bretteville, Paul
Dimond, Mrs. W. W.
Effinger, Dorothy
Falke, Mrs. H.
Farwell, Mrs. J. W.
Gignoux, Mrs. A. J.
Gray, Mrs. L. M.
Graham, Mrs. W. M.
Grote, Mary
Halsey, Mrs. R. L.
Hampton, Wm. J.
Higgins, Mrs. J. E.
Hill, Mina
Jones, Mrs. Eddie
Keller, Mrs. A. R.
Kuhns, B. B.
Lucas, Harry
McClellan, Josephine

McCrosson, Anne
McIntyre, Agnes
Melanphy, Mrs. J.
Monsarrat, Mrs. Wm.
Nakuina, Mrs. M.
Olseon, Rachel
Osborn, George
Parsons, Mrs. Albert
Perry, Mrs.
Podmore, Mrs. J. W.
Porter, Mrs. B. E.
Raven, Mrs. C. H.
Robinson, Mrs. J.
Schaefer, Irmgard
Schnoor, Miss
Soper, Mrs. Wm.
Stackable, Mrs. R. C.
Sharp, Mrs. J. Stuart
Taylor, Mrs. W. E.
Wakefield, Mrs. Jas.
Wall, Mrs. T. E.
Wood, Dorothy
Warren, Mrs. J. T.

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